



New Jersey Department of Environmental Protection
Division of Science and Research
Post Office Box 409, Trenton
Water Monitoring Project
Water Monitoring Management

James E. Mumman, Administrator

SEPTEMBER 1998
REAPPRAISAL REPORT
SHELLFISH GROWING AREA #DB-3
DELAWARE BAY
REMOTE AREA FROM
CAPE MAY POINT TO FORTESCUE CREEK

1995 - 1998

Water Monitoring Report Prepared by:

Deborah Watkins

Project Manager

Bureau of Marine Water Monitoring

PO Box 405 Stoney Hill Road

Leeds Point, NJ 08220

William J. Eisele, Jr., Chief

STATE OF NEW JERSEY
CHRISTINE TODD WHITMAN
GOVERNOR

REAPPRAISAL REPORT
SHELLFISH GROWING AREA DB-3
DELAWARE BAY
REMOTE AREA FROM
CAPE MAY POINT TO FORTESCUE CREEK

1995 - 1998



New Jersey Department of Environmental Protection
ROBERT C. SHINN, Jr.
COMMISSIONER

**This report was funded
by a State General Appropriation
and the
Federal Clean Water Act**

Written by: Deborah Watkins
Project Manager
Date _____

Edited by: Bonnie J. Zimmer, Ph.D.
Environmental Scientist
Date _____

Reviewed by: William J. Eisele, Jr.
Bureau Chief
Date _____

Approved by: James E. Mumman
Administrator
Date _____

TABLE OF CONTENTS

| | |
|--|-----------|
| Executive Summary | 1 |
| INTRODUCTION | 1 |
| Purpose | 1 |
| History | 2 |
| Functional Authority | 3 |
| Importance of Sanitary Control of Shellfish | 4 |
| Description | 5 |
| Location | 5 |
| Description | 7 |
| History | 7 |
| METHODS | 8 |
| BACTERIOLOGICAL INVESTIGATION AND DATA ANALYSIS | 8 |
| Marine Biotoxins | 9 |
| Shoreline Survey | 10 |
| Evaluation of Biological resources | 10 |
| Changes since last survey | 10 |
| Marinas | 10 |
| Spills or Other Unpermitted Discharges | 10 |
| HYDROGRAPHY and Meteorology | 10 |
| Water Quality studies | 11 |
| Bacteriological Quality | 11 |
| Interpetation and Discussion of Data | 12 |
| Bacteriological | 12 |
| Conclusions | 13 |
| Bacteriological Evaluation | 13 |
| Recommendations | 13 |
| Bacteriological Evaluation | 13 |
| LITERATURE CITED | 13 |
| ACKNOWLEDGMENTS | 14 |
| APPENDICES | 15 |

TABLE OF FIGURES

| | |
|--|-----------|
| Figure 1: State of New Jersey Shellfish Agencies | 4 |
| Figure 2: Location of Shellfish Growing Area DB-3 | 6 |
| Figure 3: Current Classification of Shellfish Growing Area DB-3 | 7 |
| Figure 4: Sampling Stations for Shellfish Growing Area DB-3 | 12 |

TABLE OF TABLES

| | |
|-------------------------------------|-----------|
| Table 1: Climatological Data | 11 |
|-------------------------------------|-----------|

EXECUTIVE SUMMARY

The water quality in Area DB-3 remains very good and is consistent with the current classification. Area DB-3 is a remote area located in the Delaware Bay. The last report for this area was submitted in October 1995, which covered data from 1987 through 1994. This report covers water quality data from 1995 through 1998. The results of this report confirm this as a remote area that has consistently displayed the same the type of water quality over the past 10 years. There will be no change in classification of Area DB-3.

INTRODUCTION

PURPOSE

This report is part of a series of studies having a dual purpose. The first and primary purpose is to comply with the guidelines of the National Shellfish Sanitation Program (NSSP) that are established by the Interstate Shellfish Sanitation Conference (ISSC). Reports generated under this program form the basis for classifying shellfish waters for the purpose of harvesting shellfish for human consumption. As such, they provide a critical link in protecting human health.

The second purpose is to provide input to the State Water Quality Inventory Report, which is prepared pursuant to Section 305(b) of the Federal Clean Water Act (P.L. 95-217). The information contained in the growing area reports is used for the New Jersey State Water Quality Inventory Report (305b) which provides an assessment to Congress every two years of current water quality conditions in the State's major rivers, lakes, estuaries, and ocean waters. The reports provide valuable information for the 305(b) report, which describes the waters that are attaining

state designated water uses and national clean water goals; the pollution problems identified in surface waters; and the actual or potential sources of pollution. Similarly, the reports utilize relevant information contained in the 305(b) report, since the latter assessments are based on instream monitoring data (temperature, oxygen, pH, total and fecal coliform bacteria, nutrients, solids, ammonia and metals), land-use profiles, drainage basin characteristics and other pollution source information.

From the perspective of the Shellfish Classification Program, the reciprocal use of water quality information from reports represent two sides of the same coin: the growing area report focuses on the estuary itself, while the 305(b) report describes the watershed that drains to that estuary.

The Department participates in a cooperative National Environmental Performance Partnership System (NEPPS) with the USEPA which emphasizes ongoing evaluation of issues

associated with environmental regulation, including assessing impacts on waterbodies and measuring improvements in various indicators of environmental health. The shellfish growing area reports are intended to provide a brief assessment of the growing area, with particular emphasis on those factors that affect the quantity and quality of the shellfish resource. As the Department implements a comprehensive watershed management

program in conjunction with the NEPPS initiative, the shellfish growing area reports provide valuable information on the overall quality of the saline waters in the most downstream sections of each major watershed. In addition, the reports assess the quality of the biological resource and provide a reliable indicator of potential areas of concern and/or areas where additional information is needed to accurately assess watershed dynamics.

HISTORY

As a brief history, the NSSP developed from public health principles and program controls formulated at the original conference on shellfish sanitation called by the Surgeon General of the United States Public Health Service in 1925. This conference was called after oysters were implicated in causing over 1500 cases of typhoid fever and 150 deaths in 1924. The tripartite cooperative program (federal, state and shellfish industry) has updated the program procedures and guidelines through workshops held periodically until 1977. Because of concern by many states that the NSSP guidelines were not being enforced uniformly, a delegation of state shellfish officials from 22 states met in 1982 in Annapolis, Maryland, and formed the ISSC. The first annual meeting was held in 1983 and continues to meet annually at various locations throughout the United States.

The NSSP *Guide for the Control of Molluscan Shellfish* sets forth the principles and requirements for the sanitary control of shellfish produced and shipped in interstate commerce in the United States. It provides the basis used by the Federal Food and Drug

Administration (FDA) in evaluating state shellfish sanitation programs. The five major points on which the state is evaluated by the FDA include:

1. The classification of all actual and potential shellfish growing areas as to their suitability for shellfish harvesting.
2. The control of the harvesting of shellfish from areas that are classified as restricted, prohibited or otherwise closed.
3. The regulation and supervision of shellfish resource recovery programs.
4. The ability to restrict the harvest of shellfish from areas in a public health emergency, and
5. Prevent the sale, shipment or possession of shellfish that cannot be identified as being produced in accordance with the NSSP and have the ability to condemn, seize or embargo such shellfish.

FUNCTIONAL AUTHORITY

The authority to carry out these functions is divided between the Department of Environmental Protection (DEP), the Department of Health and Senior Services and the Department of Law and Public Safety. The Bureau of Marine Water Monitoring (BMWM) under the authority of N.J.S.A. 58:24 classifies the shellfish growing waters and administers the special resource recovery programs. Regulations delineating the growing areas are promulgated at N.J.A.C. 7:12 and are revised annually. Special Permit rules are also found at N.J.A.C. 7:12 and are revised as necessary.

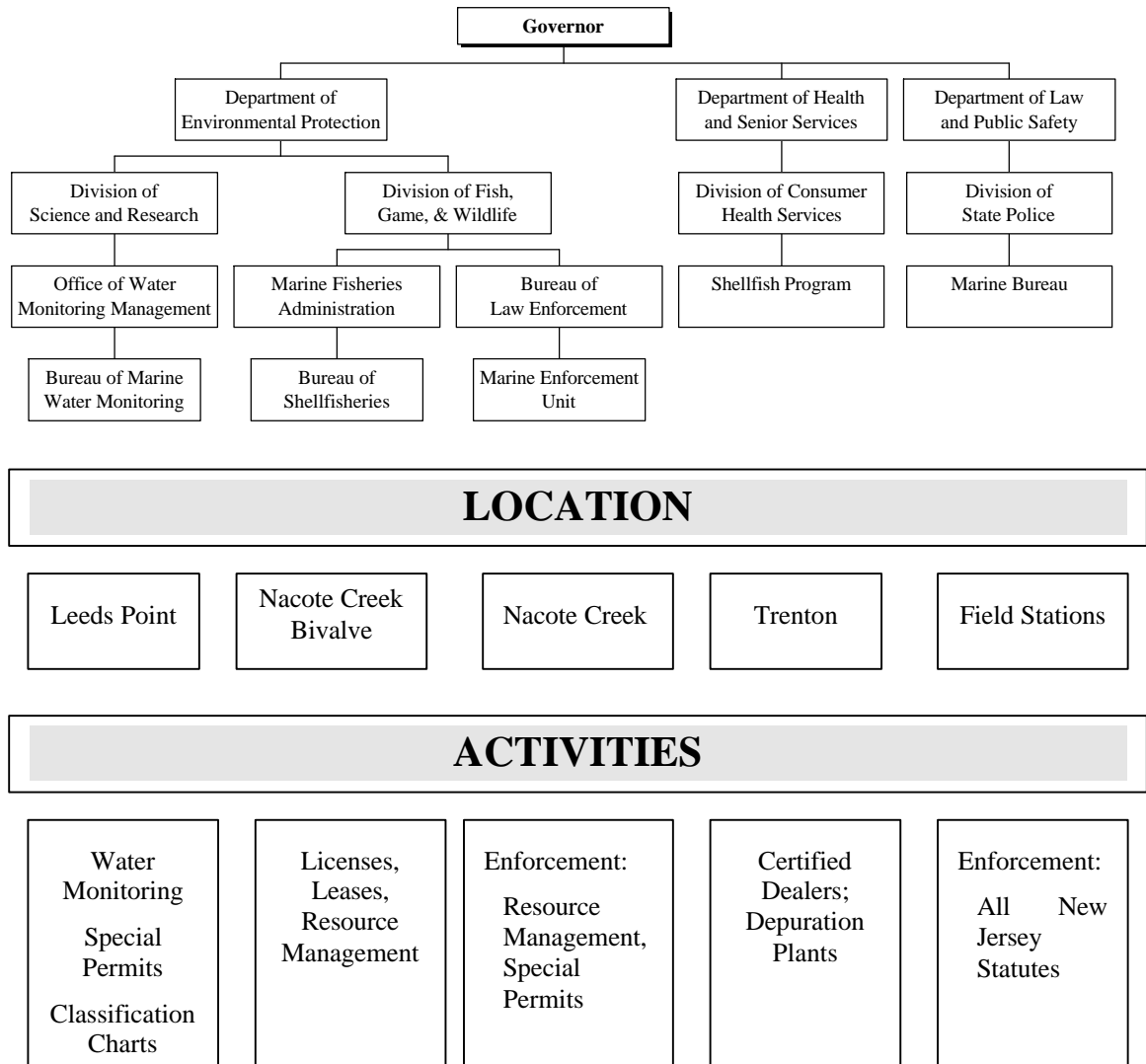
The Bureau of Shellfisheries in the Division of Fish, Game and Wildlife issues harvesting licenses and leases for

shellfish grounds under the Authority of N.J.S.A. 50:2 and N.J.A.C. 7:25. This bureau in conjunction with the BMWM administers the Hard Clam Relay Program.

The Bureau of Law Enforcement in the DEP (Division of Fish, Game, and Wildlife) and the Division of State Police in the Department of Law and Public Safety enforce the provisions of the statutes and rules mentioned above.

The Department of Health and Senior Services is responsible for the certification of wholesale shellfish establishments and in conjunction with the BMWM, administers the depuration program.

FIGURE 1: STATE OF NEW JERSEY SHELLFISH AGENCIES



IMPORTANCE OF SANITARY CONTROL OF SHELLFISH

Emphasis is placed on the sanitary control of shellfish because of the direct relationship between pollution of shellfish growing areas and the transmission of diseases to humans. Shellfish borne infectious diseases are generally transmitted via a fecal-oral route. The pathway is complex and

quite circuitous. The cycle usually begins with fecal contamination of the shellfish growing waters. Sources of such contamination are many and varied. Contamination reaches the waterways via runoff and direct discharges.

Clams, oysters and mussels pump large quantities of water through their bodies during the normal feeding process. During this process the shellfish also concentrate microorganisms, which may include pathogenic microbes, and toxic heavy metals/chemicals. It is imperative that a system is in place to reduce the human health risk of consuming shellfish from areas of contamination.

Accurate classifications of shellfish growing areas are completed through a comprehensive sanitary survey. The principal components of the sanitary survey report include:

1. An evaluation of all actual and potential sources of pollution,

2. An evaluation of the hydrography of the area and
3. An assessment of water quality. Complete intensive sanitary surveys are conducted every 12 years with interim narrative evaluations completed on a three year basis. If major changes to the shoreline or bacterial quality occur, then the intensive report is initiated prior to its 12 year schedule.

The following narrative constitutes this bureau's assessment of the above mentioned components and determines the current classification of the shellfish growing waters.

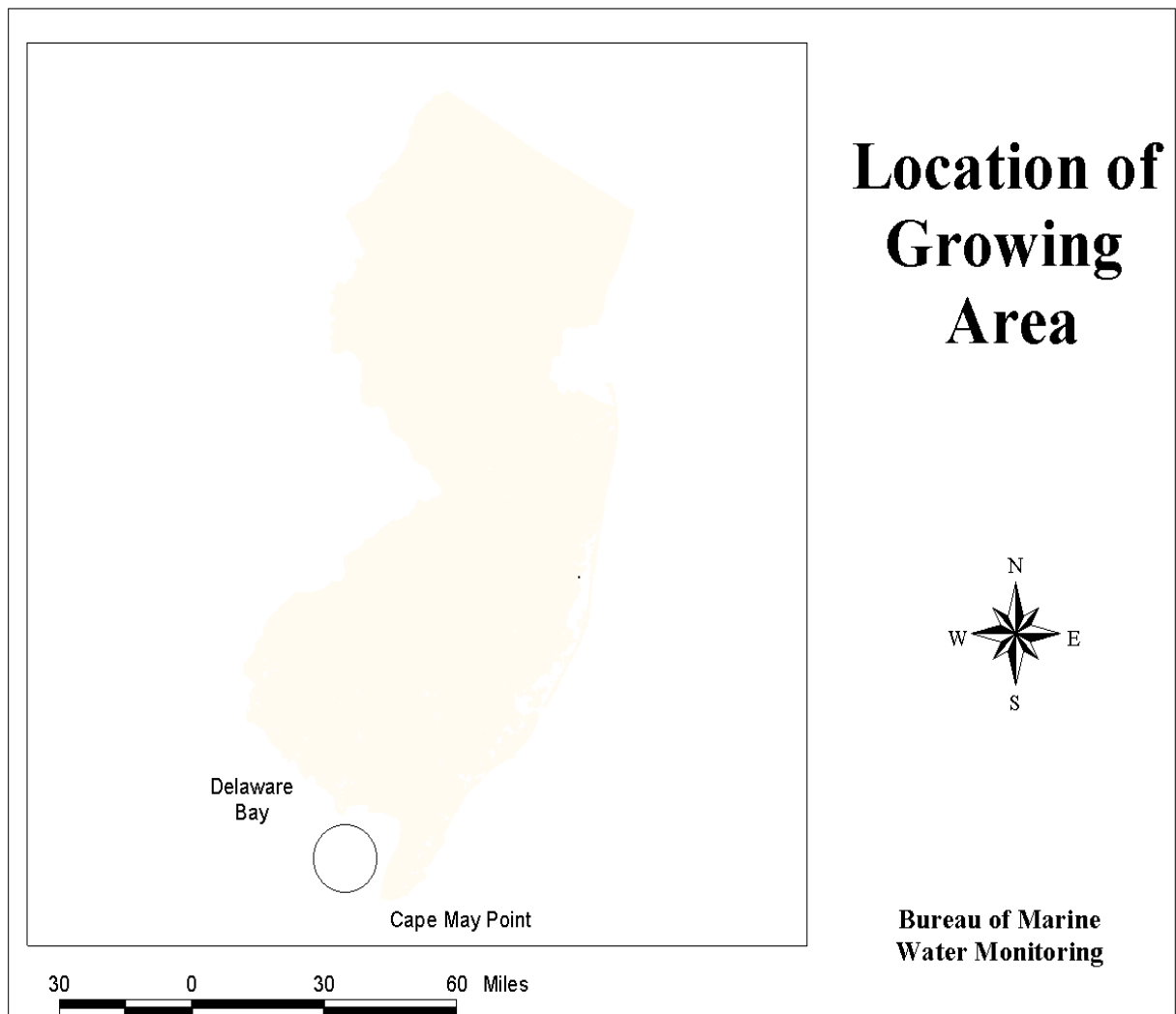
DESCRIPTION

LOCATION

Area DB-3 is located entirely within the Delaware Estuary and covers an area that includes Brandywine Shoal, Deadmans Shoal, Crow Shoal and Cross Ledge. The Delaware Estuary is 138 miles in length and averages 15 miles in width. Figure 2 shows the location of

Area DB-3. It can also be found on chart #10 of the NJ Shellfish Growing area classification chart.

FIGURE 2: LOCATION OF SHELLFISH GROWING AREA DB-3

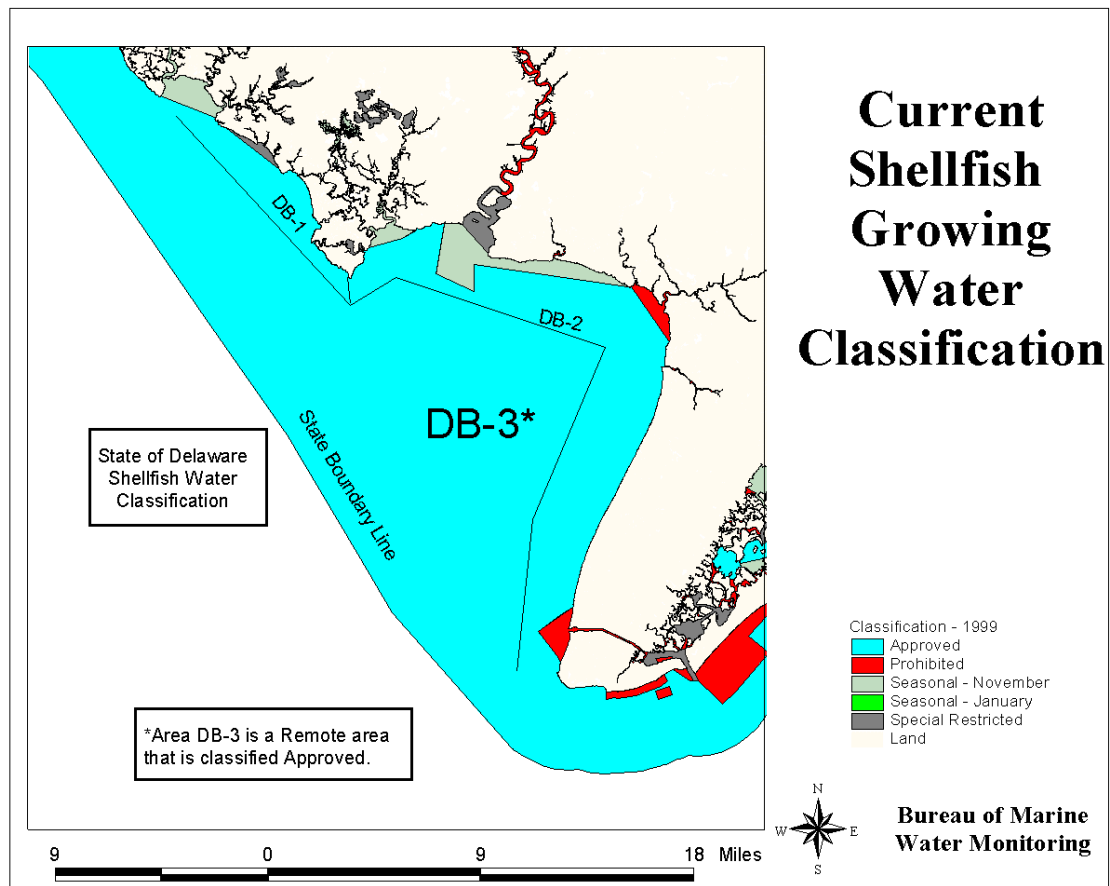


DESCRIPTION

There are no shorelines to be evaluated around Area DB-3 because it is a remote area. There are no actual or potential

pollution sources. Figure 3 shows the current classification.

FIGURE 3: CURRENT CLASSIFICATION OF SHELLFISH GROWING AREA DB-3



HISTORY

Area DB-3 has been classified as a remote area since 1992. The National Shellfish Sanitation Program's Guide for the Control of Molluscan Shellfish, Chapter IV@.03-A.(5)(d), states that a

growing area may be placed in the remote status if: (i) A sanitary survey determines that the area has no human habitation, and is not impacted by any actual or potential pollution sources;

and, (ii) The area is presently in the approved classification. This was based on the NSSP Manual which refers to a remote shellfish area as “a shellfish growing area that has no human habitation and is not impacted by any

actual or potential pollution sources.” The last reappraisal report for Area DB-3 was October 1995. The next sanitary survey is scheduled for the year 2004.

METHODS

Water sampling was performed in accordance with the Field Procedures Manual (NJDEP, 1992).

Approximately 480 water samples were collected for total and fecal coliform bacteria between 1995 and 1998 and analyzed by the three tube MPN method according to APHA (1970). Figure 4 shows the Shellfish Growing Water Quality monitoring stations in the Delaware Bay. Approximately 12 stations are monitored during each year.

BACTERIOLOGICAL INVESTIGATION AND DATA ANALYSIS

The water quality of each growing area must be evaluated before an area can be classified as *Approved*, *Seasonally Approved*, *Special Restricted*, or *Seasonal Special Restricted*. Criteria for bacterial acceptability of shellfish growing waters are provided in Part I of National Shellfish Sanitation Program Manual of Operations - 1995 Revision, and the Guide for the Control of Molluscan Shellfish – 1997 Revision. Each shellfish producing state is directed to adopt either the total coliform criterion, or the fecal coliform criterion. While New Jersey bases its growing water classifications on the total coliform criterion, it does make corresponding fecal coliform determinations for each sampling station,

Water quality sampling, shoreline and watershed surveys were conducted in accordance with the NSSP *Guide for the Control of Molluscan Shellfish*, 1997.

Data management and analysis was accomplished using database applications developed for the Bureau. Mapping of pollution data was performed with the Geographic Information System (GIS:ARCVIEW).

these data are viewed as adjunct information and are not directly used for classification. The State Shellfish Control Authority also has the option of choosing one of the two water monitoring sampling strategies for each growing area.

The Adverse Pollution Condition Strategy requires that a minimum of five samples be collected each year under conditions that have historically resulted in elevated coliforms in the particular growing area. The results must be evaluated by adding the individual station sample results to the preexisting bacteriological sampling results to constitute a data set of at least 15 samples for each station. The adverse pollution

conditions usually are related to tide, and rainfall, but could be from a point source of pollution or variation could occur during a specific time of the year. Under this strategy, for *Approved* waters, the total coliform median or geometric mean MPN of the water shall not exceed 70 per 100 mL and not more than 10 percent of the samples exceed an MPN of 330 per 100 mL for the 3-tube decimal dilution test. For *Special Restricted* waters, the total coliform median or geometric mean MPN of the water shall not exceed 700 per 100 mL and not more than 10 percent of the samples exceed an MPN of 3300 per 100 mL for the 3-tube decimal dilution test. Areas to be Approved under the Seasonal classification must be sampled and meet the criterion during the time of the year that it is approved for the harvest of shellfish.

The Systematic Random Sampling strategy requires that a random sampling plan be in place before field sampling begins and can only be used in areas that are not affected by point sources of contamination. A minimum of six samples per station are to be collected each year and added to database to obtain a sample size of 30 for statistical analysis. The bacteriological quality of every sampling station in *Approved* areas shall have a total coliform median or geometric mean MPN not exceeding 70 per 100 mL

MARINE BIOTOXINS

The Department in cooperation with EPA collects samples at regular intervals throughout the summer to determine the occurrence of marine biotoxins. This data is evaluated weekly by the Bureau of

and the estimated 90th percentile shall not exceed an MPN of 330 per 100 mL. For *Special Restricted* areas, the bacteriological quality shall not exceed a total coliform median or geometric mean MPN of 700 per 100 mL and the estimated 90th percentile shall not exceed an MPN of 3,300 per 100 mL.

The Remote Sampling strategy requires the fecal coliform median or geometric mean MPN of the water sample to not exceed 14 per 100 mL, and not more than 10 percent of the samples can exceed an MPN of 49 MPN per 100 mL for a 3 tube decimal dilution test. It also requires a minimum of 2 samples to be collected annually. Additionally, a minimum of the most recent 15 samples collected must be used to calculate the median or geometric mean and percentage to determine compliance with the standard established for the approved classification of the remote growing area.

Area DB-3 is sampled under the Remote Sampling strategy. In remote shellfish areas, the sampling intensity and frequency shall be at the discretion of the SSCA (State Shellfish Control Agency). The Department has determined that a sampling intensity of five samples per station annually will accurately analyze the remote areas.

Marine Water Monitoring in accordance with the NSSP requirements. An annual report is compiled by the Bureau of Freshwater and Biological Monitoring.

SHORELINE SURVEY

EVALUATION OF BIOLOGICAL RESOURCES

Area DB-3 is completely surrounded by water. The waters surrounding Area DB-3 are found in Areas DB-1 and DB-2 which both had shoreline investigations.

However, the shoreline situations in DB-1 and DB-2 do not have an impact on Area DB-3.

CHANGES SINCE LAST SURVEY

There have been no changes since the last survey dated October 1995.

Marinas

There are no marinas in Area DB-3. The closest marinas to DB-3 are located in

Area DB-2. These marinas have no effect on DB-3.

Spills or Other Unpermitted Discharges

There were no spills recorded in area DB-3 during this survey period.

HYDROGRAPHY AND METEOROLOGY

A detailed hydrography report was completed for Area DB-3 in the last report dated October 1995. There have been no significant changes in hydrography since the last report. Precipitation inputs to the area for the period 1995 through 1998 are shown in Table 1. The primary weather station for this area is Millville. The secondary weather station for this area is Cape May. The secondary station data is used

when data from the primary station is incomplete. There is no significant correlation to rainfall found at any of the 12 stations. In four of the stations the t-Probability could not be calculated because there was no variance in the geometric mean values. Although the other stations could calculate a value the variance was very minimal therefore showing no real correlation with rainfall.

TABLE 1: CLIMATOLOGICAL DATA

Rainfall Recorded at NOAA's Cape May Station
at Midnight

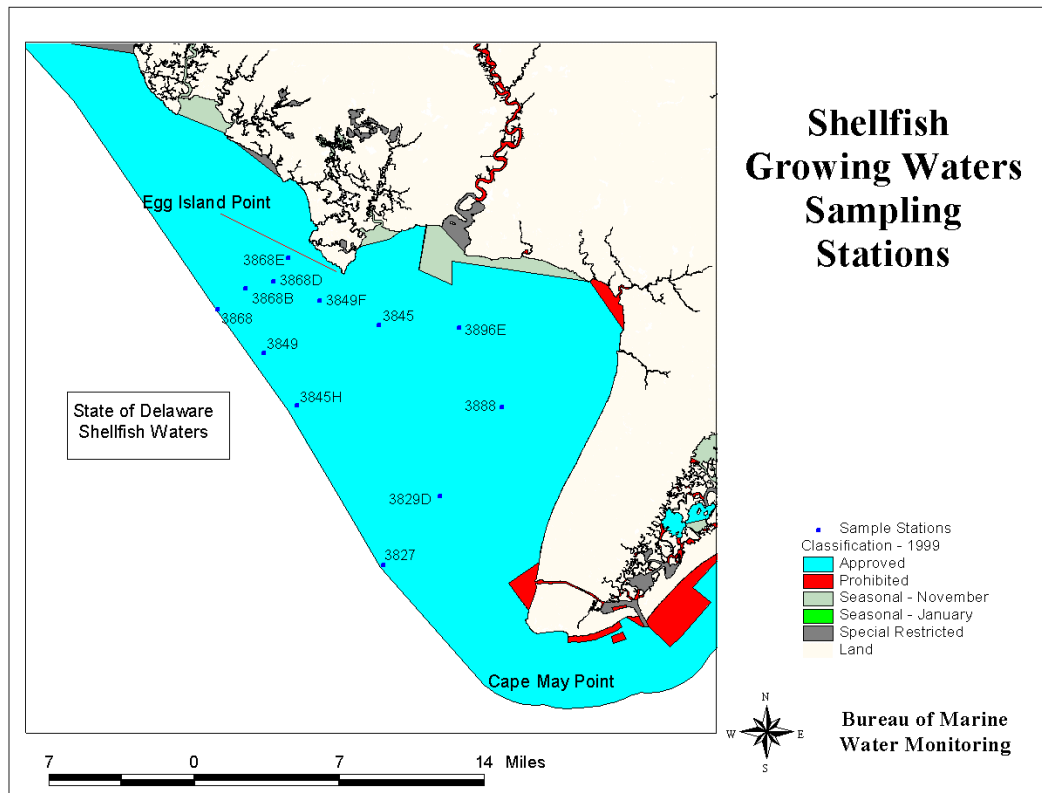
| Sampling Date | Precipitation in Inches | | | |
|---------------|-------------------------|-------------|--------------|--------------|
| | Day of Sampling | 1 day prior | 2 days prior | 3 days prior |
| 07-05-95 | 0.000 | 0.000 | 0.000 | 0.060 |
| 07-12-95 | 0.000 | 0.260 | 0.265 | 0.265 |
| 09-05-95 | 0.000 | 0.000 | 0.000 | 0.020 |
| 10-02-95 | 0.000 | 0.000 | 0.000 | 0.000 |
| 05-07-96 | 0.490 | 0.160 | 0.350 | 0.000 |
| 06-12-96 | 0.620 | 0.750 | 0.750 | 0.750 |
| 07-17-96 | 0.000 | 0.130 | 0.300 | 0.300 |
| 08-14-96 | 0.000 | 3.250 | 3.530 | 3.530 |
| 08-28-96 | 0.020 | 0.020 | 0.020 | 0.020 |
| 12-05-96 | 0.000 | 0.000 | 0.000 | 0.330 |
| 05-20-97 | 0.080 | 0.080 | 0.080 | 0.080 |
| 05-30-97 | 0.050 | 0.050 | 0.050 | 0.050 |
| 06-10-97 | 0.000 | 0.000 | 0.000 | 0.000 |
| 08-12-97 | 0.000 | 0.000 | 0.000 | 0.000 |
| 05-01-98 | 0.570 | 0.570 | 0.570 | 0.570 |
| 05-26-98 | 0.010 | 0.010 | 0.010 | 0.010 |
| 07-14-98 | 0.000 | 0.000 | 0.000 | 0.000 |
| 08-11-98 | 0.080 | 0.400 | 0.400 | 0.400 |
| 09-16-98 | 0.000 | 0.000 | 0.000 | 0.010 |

WATER QUALITY STUDIES

BACTERIOLOGICAL QUALITY

Raw data listings and statistical summaries according to the National Shellfish Sanitation Program (NSSP) criteria are given in the appendix. Figure 4 shows the location of the sampling stations used to generate the information used in the analysis for this report. There are 12 sampling stations in the DB-3 area.

FIGURE 4: SAMPLING STATIONS FOR SHELLFISH GROWING AREA DB-3



INTERPETATION AND DISCUSSION OF DATA

BACTERIOLOGICAL

There is no significant tidal component to water quality found at any to the 12 stations in Area DB-3. In nine out of the ten stations the t-Probability could not be calculated because there was no variance in the geometric mean values for ebb and flood tide. Although the other stations could calculate a value the

variance was still very minimal therefore showing no real correlation with tides. Area DB-3 has no point sources such as storm drains that enter the area. The closest influence would come from areas along the Delaware shoreline. However, they are distant enough that they cause no detrimental effect to area DB-3. There is also no seasonal effect in this area.

CONCLUSIONS

BACTERIOLOGICAL EVALUATION

Water quality in Area DB-3 remains very good with 100% of the twelve stations in

compliance with the existing *Approved* water quality classification.

RECOMMENDATIONS

BACTERIOLOGICAL EVALUATION

It is recommended that the *Approved* classification for Area DB-3 remain as is. DB-3 will continue to be considered as a Remote Area and classified as

Approved waters. The area should continue to be sampled 5 times throughout the year.

LITERATURE CITED

APHA. 1970. Recommended Procedures for the Examination of Seawater and Shellfish, 4th ed., American Public Health Association, Washington, DC

APHA. 1995. Standard Methods for the Examination of Water and Wastewater, 19th ed., American Public Health Association, Washington, DC

Connell, R.C. 1991. Evaluation of Adverse Pollution Conditions in New Jersey's Coastal Waters. New Jersey Department of Environmental Protection, Marine Water Classification and Analysis, Leeds Point, NJ.

NJDEP. 1992. Field Sampling Procedures Manual. New Jersey Department of Environmental Protection, Trenton, NJ.

NJDEP. 1997. State of New Jersey Shellfish Growing Water Classification Charts. New Jersey Department of Environmental Protection, Marine Water Monitoring, Leeds Point, NJ.

NJDEP. 1997. State of New Jersey Shellfish Growing Water Classification Charts. New Jersey Department of Environmental Protection, Marine Water Monitoring, Leeds Point, NJ.

USPHS. 1995. National Shellfish Sanitation Program Manual of Operations, Part I: Sanitation of Shellfish Growing Areas. US Public Health Service, Food and Drug Administration, Washington, DC

Annual Summary of Phytoplankton Blooms and Related Conditions in New Jersey Coastal Waters. New Jersey

Department of Environmental Protection, Marine Water Monitoring, Leeds Point, NJ. Summer 1997.

ISSC 1997. Guide for the Control of Molluscan Shellfish. U.S. Department of Health and Human Services, Public Health Service, Food and Drug Administration.

ACKNOWLEDGMENTS

This report was written under the direction of William J. Eisele, Jr., Chief, and James E. Mumman, Administrator. Robert Connell and Bonnie Zimmer assisted in statistical and GIS data analysis. Special acknowledgment is given to Captain Buzby for his perseverance in collecting shellfish water quality samples in the Delaware Bay. This study would not have been completed without the analytical capabilities of our microbiology laboratory staff, including Eric Feerst, Supervisor, Bruce Hovendon, Jean Campbell, Bob Shuster, Felicia Fieo, Sheldon McBee and Bob Seabrook.

APPENDICES

- A. Statistical Summaries
 - Yearround
- B. Seasonal Evaluation
- C. Precipitation
 - Rainfall Correlation
 - Cumulative Rainfall
- D. Tidal Evaluation
- E. Data Listing - 1995 through 1998